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# *Indian Standard*

## SPECIFICATION FOR STEEL INGOTS AND BILLETS FOR THE PRODUCTION OF HARD-DRAWN STEEL WIRE FOR UPHOLSTERY SPRINGS

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# Indian Standard

## SPECIFICATION FOR STEEL INGOTS AND BILLETS FOR THE PRODUCTION OF HARD-DRAWN STEEL WIRE FOR UPHOLSTERY SPRINGS

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# *Indian Standard*

## SPECIFICATION FOR STEEL INGOTS AND BILLETS FOR THE PRODUCTION OF HARD-DRAWN STEEL WIRE FOR UPHOLSTERY SPRINGS

### 0. F O R E W O R D

**0.1** This Indian Standard was adopted by the Indian Standards Institution on 19 May 1976, after the draft finalized by the Wrought Steel Products Sectional Committee had been approved by the Structural and Metals Division Council.

**0.2** With the rapid industrialization in the country, quite a number of mini steel plants have come up. As there is no standard specification available for ingots or cast billets, it is felt that there may be a possibility of sub-standard material being introduced in the engineering industry and constructional purposes which is not desirable. The Government of India, Ministry of Industrial Development has desired that the mini steel plants should be registered for the manufacture of steel ingots of different categories. In order to assure the quality of ultimate products it has become necessary to issue standards covering their products. This standard is one of a series of Indian Standards on steel ingots and billets. Other standards published so far in the series are given on the fourth cover page.

**0.3** The Committee is keenly interested in getting the feed-back data on suitability of ingots produced to this standard from users of ingots for the production of springs, wire rods, etc. The Committee will very much appreciate if this data is made available for reviewing this standard.

**0.4** For the benefit of the purchaser, an informative appendix (*see Appendix A*) giving particulars to be specified by the purchaser while ordering material to this standard has been included.

**0.5** For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960\*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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\*Rules for rounding off numerical values (*revised*).

## 1. SCOPE

**1.1** This standard covers the requirements for ingots (including cast billet ingots) and billets (including continuous cast billets) for the production of hard-drawn steel wires for upholstery springs.

**1.2** Ingots (including cast billet ingots) and billets (including continuous cast billets) covered by this standard shall be used for the manufacture of hard-drawn steel wires conforming to the requirements of IS : 2589-1975\*.

## 2. TERMINOLOGY

**2.0** For the purpose of this standard, the following definitions shall apply.

**2.1 Ingot** — Castings of suitable shape and size intended for subsequent hot working.

**2.2 Cast Billet Ingot** — An ingot, generally of cross section not more than 150 mm square which can be rolled directly into merchant products. Cast billet ingot is also sometimes known as 'pencil ingot'.

**2.3 Billet** — A semi-finished product obtained by forging or rolling, usually square and not exceeding 125 × 125 mm in cross section with rounded corners and is intended for further processing into suitable finished product by forging or re-rolling.

**2.4 Continuous Cast Billet** — A semi-finished product obtained by continuous casting, usually square and not exceeding 125 × 125 mm in cross section with rounded corners and is intended for further processing into suitable finished product by forging or re-rolling.

## 3. GRADES

**3.1** Steel for hard-drawn steel wire shall be of one grade, as specified in Table 1.

## 4. SUPPLY OF MATERIAL

**4.1** The general requirements relating to the supply of steel shall conform to IS : 1387-1967†.

## 5. MANUFACTURE

**5.1** Steel shall be manufactured by open hearth, electric, duplex, basic oxygen or a combination of these processes. In case any other process is employed by the manufacturer, prior approval of the purchaser should be obtained.

\*Specification for hard-drawn steel wire for upholstery springs (*first revision*).

†General requirements for the supply of metallurgical materials (*first revision*).

## 6. CHEMICAL COMPOSITION

**6.1** The ladle analysis of the material when analyzed in accordance with the various parts of IS : 228\*, shall be as given in Table 1.

**TABLE 1 CHEMICAL COMPOSITION**

(*Clauses 3.1 and 6.1*)

CONSTITUENT	PERCENT
Carbon	0·45 to 0·80
Silicon	0·15 to 0·35
Manganese	0·40 to 1·00
Sulphur, <i>Max</i>	0·050
Phosphorus, <i>Max</i>	0·050

**6.1.1** In case of continuous cast billets the billet analysis shall be taken as ladle analysis.

**6.2** Permissible variation in case of product analysis (*see 7*) from the limits specified in **6.1** shall be as follows:

Constituent	<i>Variation Over the Specified Maximum or Under the Minimum Limits</i>	Percent
Carbon	0·03	
Manganese	0·04	
Silicon	0·03	
Sulphur	0·005	
Phosphorus	0·005	

**NOTE** — Variations shall not be applicable both over and under the specified limits in several determinations in a heat.

## 7. SAMPLING

**7.1** At least one ladle sample analysis shall be taken per cast.

**7.2** If required, the samples for product analysis shall be prepared by forging or rolling down to 30-mm round section.

**7.2.1** In case of wire rods the test piece size shall be the size of wire rods.

**7.2.2** Drilling shall be taken from the sample (*see 7.2*) representing two-thirds, half and one-third of height from bottom of the ingot separately.

\*Methods of chemical analysis of steels (*second revision*).

**7.2.3** In case of continuous cast billets and billets produced from ingots of masses 3 tonnes and more, the sample (*see 7.2*) may be taken from anywhere from the billets.

## 8. FREEDOM FROM DEFECTS

**8.1** The billets and continuous cast billets shall be free from harmful defects, such as pipe, laminations, segregation, inclusions and cracks.

**8.1.1** Subject to agreement between the purchaser and the manufacturer, the billets and continuous cast billets may be supplied with suitable surface dressing.

**8.2** Ingots shall either be supplied free from harmful segregation, piping, cracks, inclusions, and blow-hole by appropriate top and bottom discard and dressing or supplied with suitable surface dressing only, without top and bottom discard if agreed to between the purchaser and the manufacturer, to ensure the requirements of freedom from defects specified in the relevant product specifications.

## 9. TESTS

**9.1** If agreed to between the purchaser and the manufacturer the following tests may be carried out from the samples prepared under **7.2**:

- a) Macroexamination and sulphur print,
- b) Hardenability (*see IS : 3848-1966\**), and
- c) Inclusion content (*see IS : 4163-1967†*).

## 10. DIMENSIONS

**10.1** The size and tolerance of ingots shall be subject to agreement between the purchaser and the manufacturer. However, the following nominal sizes of ingots generally supplied are given below for guidance only:

<i>Width Across Flat, mm</i>		<i>Length mm</i>
<i>Wide End</i>	<i>Narrow End</i>	
100	76	1 500
115	90	1 200
125	105	1 500
150	120	1 300
150	130	1 500

\*Method for end quench test for hardenability of steel.

†Method for determination of inclusion content in steel by microscopic method.

**10.2** The preferred sizes of billets shall be 50, 63, 71, 80, 90, 100 and 125 mm.

**10.3** The sizes other than those specified may be supplied by agreement between the purchaser and the manufacturer.

## 11. TOLERANCES

**11.1** In case of billets the following tolerances shall apply:

<i>Width Across Flat</i>	<i>Tolerance</i>
mm	mm
Up to 75	$\pm 1.5$
Over 75 up to and including 100	$\pm 2.0$
Over 100	$\pm 3.0$

**11.2** A tolerance of  $\pm 150$  mm shall be permitted on the specified length of ingots and billets.

## 12. MARKING

**12.0** Unless agreed otherwise, the material shall be marked as given in **12.1** and **12.2**.

**12.1** The ends of ingots and billets shall be painted with a suitable colour code conforming to IS : 2049-1963\*.

**12.2** Each ingot and billet shall be legibly stamped or painted with the cast number, grade and the name or trade-mark of the manufacturer.

**12.2.1** The material may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

\*Colour code for the identification of wrought steels for general engineering purposes.

**A P P E N D I X A**  
*( Clause 0.4 )*  
**BASIS FOR ORDER**

**A-1.** While placing an order for the ingots/billets covered by this standard, the purchaser should specify clearly the following:

- a) Steel grade;
- b) Size of ingot/billet;
- c) Size and dimensions of end product;
- d) End use;
- e) Tests and test reports required; and
- f) Special requirements, if any.

**INDIAN STANDARDS  
ON  
STEEL INGOTS AND BILLETS**

**IS:**

- 8051-1976 Steel ingots and billets for the production of volute, helical and laminated springs for automotive suspension
- 8052-1976 Steel ingots and billets for the production of volute and helical springs (for railway rolling stock)
- 8053-1976 Steel ingots and billets for the production of steel wire for the manufacture of wood screws
- 8054-1976 Steel ingots and billets for the production of laminated springs (railway rolling stock)
- 8055-1976 Steel ingots and billets for the production of spring washers
- 8057-1976 Steel ingots and billets for the production of wire rod for the manufacture of machine screws (by cold heading process)

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TO

IS:8056-1976   SPECIFICATION FOR STEEL INGOTS  
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OF HARD-DRAWN STEEL WIRE  
FOR UPHOLSTERY SPRINGS

Alteration

(Page 6, informal table under clause  
10.1, third column) - Delete.

(SMDC 5)

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Reprography Unit, ISI, New Delhi